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ABSTRACT

This four-part booklet presents the techniques of Work Study and their application to cargo operations in ports. The four parts contain discussions of the following: I. Productivity and Our Standard of Living; II. The Application of Work Study; III. Brief Explanation of Some Work Study Techniques (Method Study and Work Measurement); and IV. Conclusion--Work Study in the port transport industry is almost inevitable, and it is preferable to encourage the use of Work Study. (DB)

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Work Study and the Port

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Foreword

by J. Morris Gifford
Director General, National Ports Council

In producing this booklet on the techniques of Work Study and how they might be applied to cargo operations in ports the Council's aim is to present the facts fairly and accurately.

The Council have no doubt that Work Study can help ports give their customers better service. This would encourage our foreign trade which in turn would lead to better living standards all round.

Work Study can also benefit the living standards of port workers more directly. The soundest basis for the improvement of wages, working conditions and job security is that the ports provide a reliable service and meet their financial obligations. To achieve these goals the ports must have modern facilities, and those facilities must be operated efficiently. Here Work Study can be of great help. By improving productivity and encouraging traffic it will help to provide the extra money needed to pay for new developments and machinery, and for better wages and conditions.

Work Study must have the full support and co-operation of the men concerned; that is fully recognised, and this booklet should help remove any mistaken ideas on that score. It will be seen that the need for consultation with representatives of the port worker at every stage of a Work Study investigation is emphasised.

I therefore commend this booklet in the hope and belief that it will improve the general understanding of what Work Study is about and so help the industry to achieve the benefits which Work Study makes possible.

PART I

Productivity and our Standard of Living

Why we should be interested in increasing Productivity

Ultimately, our wealth and our standard of living are determined by our ability as a Nation to produce and market goods at a lower cost than other countries. Cargo transport and handling add to the overall cost but do not add to the value of the cargo. Any improvement that can be made in the productivity of the port transport industry improves our ability to compete abroad and can help to safeguard our future standard of living.

Productivity Defined

In view of its importance it is as well to define what is meant by *Productivity*. It is the relationship between the value of a product or service (the 'output') and the cost of the resources used (the 'input') – that is manpower, machinery and administration.

It should not be confused with *Production*. If the *input* and *output* of a particular job are doubled, *production* is doubled, but *productivity* remains unchanged. If on the other hand the input (man-hours, equipment, etc.) remains the same but output is doubled, *productivity* is also doubled.

How we can increase Productivity

Ideas for making improvements come from individuals who can and should ask their supervisors to try them out. However, real improvements in productivity, although the ideas may be very good, depend upon obtaining the agreement and co-operation of our colleagues.

In these times of rapid change management tends to be pre-occupied with the organisation of day-to-day work and as a result may not be able to devote sufficient time to improving working methods.

Over the years a number of techniques for improving productivity have been developed. One of these is Work Study. This technique tends to expose any weaknesses of work planning and indicates how men, machines and equipment can be used more effectively.

A number of Devlin Stage II agreements recently introduced in the ports make provision for Work Study and recommend the use of training and appreciation courses in the subject. Indeed the introduction of Work Study is a normal part of Productivity Agreements, because of its value in determining better methods and planning manpower on a logical, consistent basis.

PART II

The Application of Work Study

What is meant by Work Study?

Work Study is the term given to the techniques for examining methods of working and for assessing the amount of work in a particular job. The main techniques are described briefly in Part III.

Used wisely, Work Study speeds progress, helps management to plan and cost work more accurately, ensures that no man is asked to do more than a fair day's work and as a result generally helps to improve industrial relations.

What about Consultation?

Consultation takes place at every stage of the Work Study investigation The shop stewards or men's representatives are kept fully in the picture from the beginning to the end. In most cases a number of them are given training in Work Study to enable them to understand the principles involved and to assist in the practical application by joining the Work Study team for the period during which their own type of work is being studied.

How do Trade Unions view Work Study?

Most Trade Unions recognise that Work Study helps to ensure a better future for their members provided there are safeguards in respect of job security, and provided their members receive a share of any savings which the organisation is able to make as a result of its application.

How does Management view Work Study?

In many industries management view Work Study as a part of their responsibility for planning and operational improvement. Since management have to make a considerable investment in Work Study staff, training, and possibly new equipment, they expect that all reasonable proposals put forward by the Work Study team will be given a fair trial. They expect their organisation as well as their men to benefit from savings resulting from Work Study. The consumer should also benefit from more stable or reduced prices.

Who does the Work Study?

In some cases a Work Study team is formed within the organisation, using experienced Work Study personnel recruited from outside together with people trained from within. For example, in one port the Work Study Manager and his assistant were recruited from other organisations,

but their team was made up of dockworkers, engineering tradesmen and others who volunteered from existing staff and who received the necessary training.

In other cases consultants who specialise in this work are used to introduce Work Study and develop a team which remains to continue the work after they leave.

Why should outsiders be necessary?

If Work Study is to be applied successfully it is essential that the man appointed to manage the team has extensive experience in Work Study. At this time there are very few men in the port industry who qualify in this respect.

Additionally, outsiders are able to approach problems without too many preconceived ideas, have no emotional attachment to the past, and are not involved in the day-to-day running of the organisation.

What happens if the Work Study man puts forward a bad suggestion?

Many safeguards are built in. First of all, the Work Study man has no authority to change practices, any changes must be agreed between the management and the work force. Secondly, management, supervisors, and shop stewards will normally be given sufficient appreciation training in Work Study to allow them to question the Work Study man's suggestions. Additionally, it is desirable that some shop stewards or workers' representatives should be trained in Work Study to practitioner standard. Thirdly, the Work Study team does not suddenly produce a report; it develops and modifies ideas in consultation with all affected staff and the situation is discussed with all concerned before the introduction of any proposed change.

What techniques are used in Work Study?

The Work Study man records what is going on in great detail, and studies the facts to find out what delays and interferences occur with the flow of work. Assuming the activity fulfils some useful purpose he challenges each part – why is it done in that way? – why is it done at that time? – why is it done by that person?

He devises possible improved ways of doing the job, calculates the cost of each alternative and after discussing these alternatives with the men makes his report to the management, who consult the men or their representatives on proposals for change.

In cargo handling, for example, the Work Study man will be anxious to make sure there is the right balance of men in the hold and on the shore to make the best use of the crane. This will mean that a detailed record of the time required to complete each part of the job will be necessary.

The techniques he will use are:

Method Study To examine critically how the work is done, and find the most suitable alternative method.

Work Measurement To establish how much time is required to do the job.

These two main techniques are explained in more detail in Part III.

For how long is a Work Study man likely to look at what I am doing?

For as long as it takes to record all that needs to be known about the job, bearing in mind that there can be variations in the amount of work involved, such as differing ship designs and seasonal influences. Where variations are known to be small the study will only cover a short period of time, perhaps only a few days. In other cases the initial studies might be spread over a longer period. This does not mean that there would be a Work Study man looking at you all the time. Perhaps over the course of the study he will be looking at the type of work you do for a total of possibly 60 to 100 hours spread over a period of several weeks.

What safeguards are built in for a man or team being studied?

Firstly, all studies must take place in accordance with an agreement, which will provide for proper consultation with your representatives. Secondly, you have the right to see what the Work Study man is writing down and so satisfy yourself that it is accurate. His subsequent records will also be open for inspection by the shop stewards. Thirdly, it is in your interest to have a number of shop stewards or representatives trained to Work Study practitioner standard, so that they are in a good position to examine any proposals for change critically and also to explain the Work Study man's findings to you.

Is there any way in which I can reduce the time which the Work Study man needs to look at my activities?

Yes, by working normally while being studied and by answering as best you can any questions which you are asked. Your supervisors, shop stewards and members of the Work Study team should be able to advise you of any detailed help that you can give them.

Does the Work Study team report on me as an individual?

No. However, since a Work Study team have to be scrupulously honest they must be able to trace each study back to the individual concerned in case of questions from the work-people later. This means they must write on the study sheets the names of the men whose work they are studying, but there is no reason to fear this, as the time which is eventually recommended for each job is not based upon the time taken by one individual but on the average of a number of men doing the same job.

What is the outcome of a Work Study exercise?

In most cases you can expect to have work far better planned and to enjoy better working conditions and easier methods of working. These changes should lead to a steadier tempo of work, more regular hours and less grounds for dispute.

Are Output Standards fixed for all time?

No. Continuous changes in technology and working practices will require methods to be reviewed from time to time and in fairness to all concerned Output Standards which are agreed for planning or control purposes must be updated as methods change. For example, in cargo handling the Output Standard for handling loose cargo would have to be changed if at some future time that same cargo were palletised.

Does this mean that Output Standards are progressively 'tightened'?

No. Output Standards, whether used for planning or for payment by result purposes are permanent for the specified commodity. equipment, method of working, quality and working conditions which exist at the time the study is taken. The Output Standards are only changed when one of these factors changes, or if it can be demonstrated that there has been an error in calculating the Output Standard originally. A detailed record is kept showing the work involved and the relaxation allowance which together make up the Standard Time for each job and this record is available for inspection in case of doubt.

What happens to Piece-Work Systems?

Under the Devlin Stage II negotiations the traditional piece-work system of payment has been replaced in many ports by new wage agreements incorporating increased basic rates. In some cases there is provision for an incentive bonus while in others the agreements provide only for timework payments. In either case the system should be based on *Work Measurement*, which provides a fairer, more sensible way of setting Output Standards and reduces the number of arguments and misunderstandings.

If redundancy is to be avoided, where does the money come from to improve working conditions and pay?

Where improved methods reduce the number of men necessary, men who retire or leave the industry for other reasons need not be replaced. Some men who are surplus to requirements may be re-trained and transferred to other port work. Clearly, such reductions in the number of men who have to be paid and for whom facilities have to be provided, will make money available to improve the lot of those who remain. A major aim of Work Study in ports is to speed the turnround of ships.

This has two possible effects:

(*a*) The organisation may be able to handle more ships and hence increase its revenue and the work available; and,

(*b*) A shipowner who is able to programme his ships consistently to a tighter timetable may be willing to pay higher charges to an organisation offering a better service.

If Work Study is going to be introduced in my organisation, can I be trained?

If you are interested you should approach your employer. Training will involve your employer in considerable expense and he will have to be satisfied that you have the aptitude for the work and the ability to express yourself well, both by word of mouth and in writing. At least ten port organisations who use Work Study have drawn staff for their team from their own work force. These men are doing a very sound job and enjoy their work.

PART III

Brief Explanation of Some Work Study Techniques

Introduction

Work Study is the term used to describe two main techniques, *Method Study* and *Work Measurement*. Method Study as its name implies is used to find the best way of doing a job and Work Measurement is used to determine the time required for carrying out that work.

Method Study

Recording the Present Method

Having selected a job for study the Work Study man charts the job in detail exactly as it happens, making sure that he observes it for a sufficient period of time to take into account possible variations.

Some of the recording techniques which are likely to prove most useful in port work are as follows:

(i) *Process Charts*. Different types of Process Charts are used depending on the degree of detail required. These charts are built up using symbols as a form of shorthand, to describe what happens in a particular activity. These symbols are as follows:

			Example
○	=	Operation	Slinging and hooking on load
□	=	Inspection	Tallying
⇨	=	Transport	Move load from quay to shed
D	=	Delay	Waiting for fork-lift truck
▽	=	Storage	Goods stowed in shed awaiting consignee

A simple example of a process chart for discharging a pallet from the hold of a ship might be as follows:

Pallet in hold

Hook on pallet

Lift and swing to quayside

Unhook pallet

Pallet waits on quay for fork-lift truck

Pick up by fork-lift truck

Transport to shed

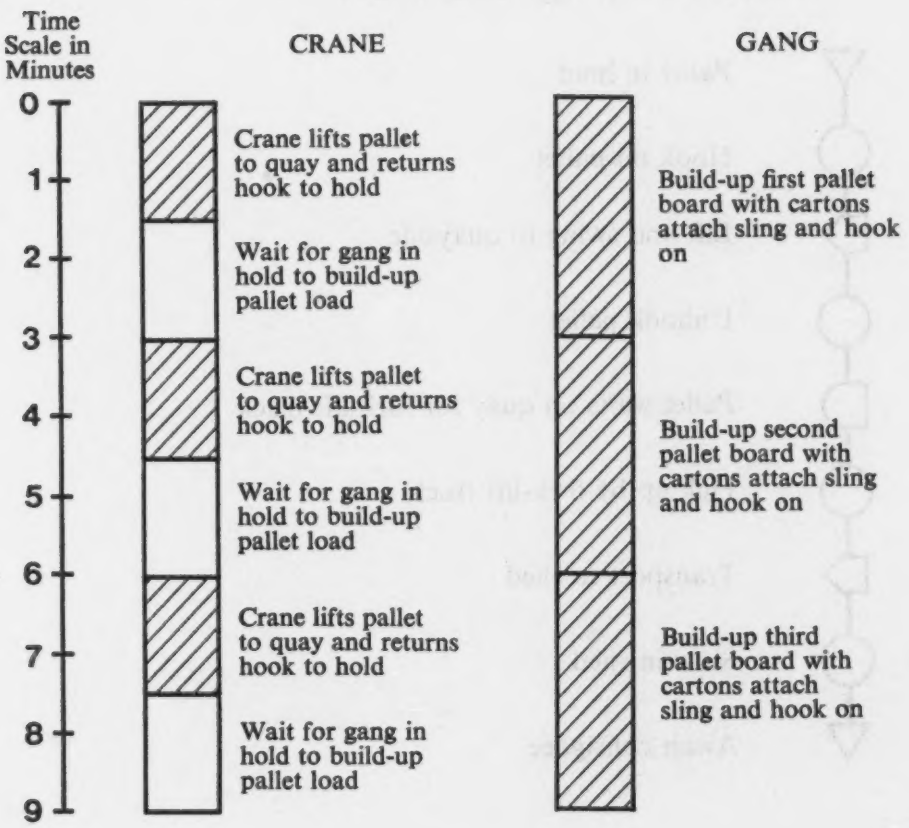
Stow in shed

Await consignee

(ii) *Multiple Activity Charts.* These charts are particularly useful in cargo handling operations since they help in deciding upon the correct balance of manpower and equipment. A Multiple Activity Chart is drawn using columns to show the activities of each man or team and the equipment they use against a common time scale.

An example is shown on the next page.

An example of a Multiple Activity Chart:


Time Scale in Minutes
0
1
2
3
4
5
6
7
8
9
CRANE
Crane lifts pallet to quay and returns hook to hold
Wait for gang in hold to build-up pallet load
Crane lifts pallet to quay and returns hook to hold
Wait for gang in hold to build-up pallet load
Crane lifts pallet to quay and returns hook to hold
Wait for gang in hold to build-up pallet load
GANG
Build-up first pallet board with cartons attach sling and hook on
Build-up second pallet board with cartons attach sling and hook on
Build-up third pallet board with cartons attach sling and hook on

KEY

Working

Idle

The chart shows that the gang is working continuously but the crane for only half of the time available; if two gangs were used working in the hold instead of one then the crane could be used for the whole of the time available.

(iii) *String Diagrams.* These are useful for showing how distances travelled by cargoes from ship to shed or vice versa can be reduced and where the main points of traffic congestion occur. In this technique threads are pinned on a scale drawing of the work area to show the movement of cargo, men or equipment. The length of the thread is measured so that the total distance travelled can be established. Where many threads are seen to cross the main points of congestion are indicated. With this information it is possible to decide how to change the layout of sheds to reduce the distance which men and fork-lift trucks have to travel and also to avoid points of congestion which cause delays.

Critical Examination

Critical examination is a questioning technique used to challenge the usefulness of present or proposed work and to suggest ideas for improvement. From detailed charts, the key operations are isolated for Critical Examination.

Key operations are those parts of a job which, if changed, alter or eliminate the operations which occur before and after them.

Example Discharging pallets from a hold:

Operation 1 Hook on pallet
2 Lift and swing ashore
3 Lower to quayside
4 Unhook pallet.

The key operation is Operation 2, since if a method of transfer could be used which avoided the lifting operation, (for example roll-on/roll-off) Operations 1 and 4 would be eliminated and Operations 2 and 3 would be modified.

The critical examination technique requires the Work Study Team to question each operation systematically as follows:

1	2	3	4
What is done?	Why is it done?	What else could be done?	What should be done?
How is it done?	Why is it done that way?	How else could it be done?	How should it be done?
When is it done?	Why is it done then?	When else could it be done?	When should it be done?
Where is it done?	Why is it done there?	Where else could it be done?	Where should it be done?
Who does it?	Why by that person?	Who else could do it?	Who should do it?

Ideas suggested by the answers to questions in Column 4 are costed and assessed objectively. The best of the alternative solutions is then tested again, by subjecting it to a further Critical Examination, by using a mock-up, and carrying out dummy runs. If successful and accepted by management and men, the improved method can then be introduced.

Work Measurement

In carrying out this technique the Work Study man concentrates his attention on three main points:

1. How long does the job take?
2. At what rate of working is it carried out?
3. What allowances must be added on?

(1) *Time Study*. The two techniques most likely to be used in studying dock operations are Time Study and Activity Sampling. By using these techniques the Observed Time (time taken) for each job is established.

Using Time Study. Each job is broken down into small units called 'elements' each of which is timed separately. The nature of the job will determine the number of times it must be seen in order to obtain a true and fair assessment of how long the job should take. This procedure is repeated on different men or teams of men performing the same task.

Activity Sampling Techniques. These are particularly useful when observing several men working as a team. A given number of observations are taken at random, from which it is possible to calculate the time required for each part of the job.

(2) *Rating*. The average time taken for each element of the job can be calculated from the data obtained by either Time Study or Activity Sampling but in order to calculate the correct time for the job an assessment must be made by the Work Study man as to how quickly or slowly the men being studied are working. This assessment is known as Rating.

Example. In every day working men work at different speeds, for example, in building a pallet load of cartons in the hold of a ship where two dockers are working side by side on separate pallets one docker might complete the build-up in three minutes and the other might take four minutes. It is therefore necessary when deciding on the correct time to be allowed for the job to take into consideration individual men's working effort in completing the job, as well as the time that they take.

By observing different men, working at different speeds doing the same job, it is possible by using rating to arrive at a fair average *basic time* for that job.

(3) *Allowances.* Every job requires some Rest Allowance; obviously more time must be allowed to recover from fatigue on heavy work than on light work. There are also allowances for personal needs such as going to the lavatory and for difficult working conditions, unusual temperatures or unusually dusty conditions, etc. By adding the allowances to the Basic Time, the *Standard Time* for the job is arrived at. This enables the correct time necessary to complete the job to be determined.

Standard Times whether used for planning or for payment by results purposes (bonus schemes), are permanent for the specified equipment, method of working, quality and working conditions which exist at the time the study is taken. The Standard Times are only changed when one of these factors changes, or if it can be demonstrated that there has been an error in calculating the Standard Time. A detailed record is kept showing the work involved and the allowances, which together make up the Standard Time for each job, and this record is available for inspection, in case of doubt, in the Work Study Office.

Where can I learn more about Work Study?

(1) There are many books available on the subject and the following introductory reading is suggested:

Work Study in Ports – A booklet produced by the National Ports Council which is available free of charge through your employer or from:

The Information Officer,
National Ports Council,
17 North Audley Street,
London, W1Y 1WE

An Outline of Work Study – Trades Union Congress Price 7½p.

Achievement Through Work Study. Stephen Webb. Pergamon Press. Price 87½p.

(2) Appreciation Courses are frequently given at local technical colleges in most parts of the country, or may be sponsored by the British Productivity Council or your employer.

(3) If you are interested in learning more about Work Study ask your employer whether he will arrange for an Appreciation Course to run in your organisation or port. If you are offered the opportunity of attending such training courses, it is recommended that you take advantage of it.

PART IV

Conclusion

Work Study is spreading rapidly into industries and organisations where it has not been used before, such as land and sea transport, air services and local government. Increased productivity in the port transport industry, *not just from dockworkers*, but also from engineering and clerical staff could be of immense value to the Nation's economy. Work Study in your organisation is almost inevitable sooner or later and it is, perhaps, preferable to encourage the use of Work Study rather than to sit back and wait for it to arrive!

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